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AB 2588 RISK ASSESSMENT FOR ROHR INC (FINAL REVISED) WITH ATTACHMENT, COVER SHEETS AND LETTER DATED 072792		
Chemical Category		
METHYL CHLOROFORM (71-55-6)		

CONTAINS NO CBI



ROHR, INC.

POST OFFICE BOX 878
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July 27, 1992

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Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

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86920001001

VIA: Courier

ATTENTION: 8(d) Health and Safety Reporting Rule (Notification/
Reporting)

Dear Sir or Madame:

Pursuant to TSCA 8(d) and 40 CFR 716, Rohr, Inc. is submitting the enclosed final revised study on the following list of chemicals:

- o Methyl Chloroform
CAS #71-55-6
- o Methylene Chloride
CAS #75-09-2
- o Perchloroethylene
CAS #127-18-4
- o Phenol
CAS #108-95-2
- o Toluene
CAS #108-88-3
- o 4,4' - Diphenylmethane Diisocyanate (aka: benzene, 1,1'- methylenebis[4-isocyanato-, MDI)
CAS #101-68-8
- o Hexamethylene Diisocyanate Monomer (aka: Hexane, 1,6- diisocyanato-)
CAS #822-06-0
- o Monomeric Toluene Diisocyanate (aka: Benzene, 1,3- diisocyanatomethyl-, TDI)
CAS #26471-62-5

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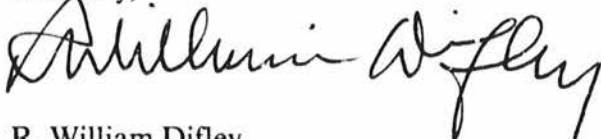
We are submitting this study to EPA under TSCA Section 8(d). We understand that this submission will satisfy any obligations we may have to report under TSCA Section 8(e) because it is submitted within 15 day time frame required by TSCA Section 8(e). Our understanding is based on EPA's June 1991 TSCA Section 8(e) Reporting Guide on page 10. Please call us immediately if our understanding is not correct.

We submitted a study on May 28, 1992. At that time, we questioned the accuracy of the estimated risks in the study because we believed the monitoring data on which they were based were erroneous. The study was re-evaluated and we are submitting the completed and revised study.

Please note, that background information (Appendix B and C) is available upon request. Should you have questions or need clarification, please do not hesitate to contact:

Diane K. Kenney, CIH
Manager, Corporate Safety and Health
Rohr, Inc.
P.O. Box 878 MZ 873
Chula Vista, California 92912
(619) 691- 6693

Sincerely,



R. William Difley
Vice President, Human Resources
(619) 691- 2048

attachment
enclosure
rwd/dkk

Attachment I.
TSCA Section 8(d) Studies

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Section 8(d) Study on Behalf of Rohr, Inc.

Pohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methyl Chloroform (CAS # 71-55-6).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official: R. William Difley
Vice President, Human Resources
Rohr, Inc.
P.O. Box 878 MZ 15
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(619) 691-2048

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Attachment II.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methylene Chloride (CAS # 75-09-2).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment III.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Perchloroethylene (CAS # 127-18-4).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment IV.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Phenol (CAS # 108-95-2).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official: R. William Difley
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Attachment V.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Toluene (CAS # 108-88-3).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment VI.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on 4,4'-Diphenylmethane Diisocyanate (aka: benzene, 1,1'-methylenebis[4-isocyanato-, MDI] (CAS # 101-68-8).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment VII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Hexamethylene Diisocyanate Monomer (aka: hexane, 1,6-diisocyanato-) (CAS # 822-06-0).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment VIII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Monomeric Toluene Diisocyanate (aka: benzene, 1,3-diisocyanatomethyl-, TDI) (CAS # 26471-62-5).

Completion Date: June 30, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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**AB 2588 RISK ASSESSMENT
FOR
ROHR, INC.**

Submitted to:

**SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 Chesapeake Drive
San Diego, California 92123**

**Contact: Tom Weeks
(619) 694-3894**

Prepared for:

**ROHR, INC.
Foot of H Street
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Prepared by:

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**Contact: Anna Peteranecz
(619) 541-1145**

June 30, 1992

**THIS DOCUMENT WAS PREPARED FOR USE ONLY BY THE CLIENT, ONLY
FOR THE PURPOSES STATED, AND WITHIN A REASONABLE TIME FROM
ITS ISSUANCE. PLEASE READ THE "LIMITATIONS" SECTION OF THIS
REPORT.**

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FOR ROHR, INC.
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EXECUTIVE SUMMARY

This is the substitute risk assessment for the Rohr, Inc. facility located at the Foot of H Street in Chula Vista, California. This risk assessment, mandated by California Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987, was conducted using emission values generated for the Emission Inventory Report (EIR) dated November 2, 1990, the EIR Addendum dated February 6, 1991, and source test reports from the salt bath, the chemical milling and chromic acid anodize lines dated June 10, and June 29, 1992. The emissions data more accurately reflect conditions appearing at Rohr's facility. Rohr specifically asserts that the original risk assessment was prepared using overestimated emission numbers. This HRA was prepared in accordance with the District-approved and mandated Health Risk Assessment Protocols dated December 12 and January 10, 1991, and corrections to the calculation errors found in the original Protocols.

Cancer risks and hazard indices have been calculated at the site of maximum impact and in other areas of concern surrounding the facility. The maximum increased number of cancer cases (cancer burden or population risk) that might be expected to occur at these sites has also been calculated.

The methods of calculating cancer risk, hazard indices, and cancer burden were based on a "worst-case" situation and are health-conservative in nature. These methods predict the maximum potential risk. That is to say, the real risks are expected to be lower than the predicted number and may be substantially lower, even approaching zero. This health-conservative approach to assessing risk is one chosen by the California Air Pollution Control Officers Association (CAPCOA) and the San Diego Air Pollution Control District (APCD) and is based upon techniques and dose/response values published by the California Department of Health Services (DHS) and the Air Resources Board (ARB).

It is well known that the CAPCOA, DHS and ARB methodologies yield the maximum hypothetical risk and do not relate to actual exposures or risks that could be experienced by persons in the vicinity of the facility. However, the APCD has mandated that all facilities use this approach in preparing their risk assessments. This standardized approach allows comparison of the relative impacts of various facilities on their surroundings.

The total maximum offsite hypothetical calculated individual cancer risk resulting from emissions of AB 2588 compounds at this facility is $1.660\text{E-}04$, located 200 meters east of the facility boundary in a residential area. This value is the risk for the maximum exposed individual (MEI). The maximum hypothetical calculated individual cancer risk for a commercial receptor is $6.047\text{E-}05$, at a location 25 meters east of the facility boundary.

The maximum distance from the facility to the $1\text{E-}05$ risk isopleth is 5.24 kilometers southeast of the facility. The maximum distance from the facility to the $5\text{E-}05$ risk isopleth is 1.20 kilometers. The maximum distance to the $1\text{E-}04$ risk isopleth is 0.60 kilometers southeast of the facility. The radius of the zone of impact (maximum distance to the $1\text{E-}06$ cancer risk isopleth) is 22 kilometers. The resulting cancer burden from emissions of all AB 2588 compounds for all potentially exposed centroid locations (APCD supplied data) inside the zone of impact is 2.97 for residential population counts, and 0.25 for occupational population counts.

The point of maximum noncarcinogenic chronic hazard index is located 10 meters east of the facility in a commercial area. The maximum chronic hazard index at this point is 0.269. The maximum chronic hazard index in a residential area is 0.093. The target organ with the maximum chronic hazard index is the liver. The maximum acute hazard index of 0.499 occurs approximately 10 meters west of the facility in a shoreline area. Neither the maximum chronic or the acute hazard indices exceed the APCD significance level of 1.0, and therefore, there are no isopleths representing health hazard indices included in this report.

1 INTRODUCTION

Kleinfelder, Inc. was retained by Rohr, Inc. to assist with the development of a Health Risk Assessment (HRA) for the Rohr facility located at the Foot of H Street in Chula Vista, California. A risk assessment is required for this facility under Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588).

Assembly Bill 2588 was enacted by the California State legislature in 1987. The intent of AB 2588 is to gather information on substances which may pose a chronic or acute threat to public health when present in the ambient air. The legislation requires that each Air District prepare a Toxic Air Contaminant Emissions Inventory that identifies significant sources of toxic air emissions in the district. A mechanism by which affected facilities could report their emissions was developed by the California Air Resources Board (CARB) and individual Districts. Potential facility emissions were to be inventoried and quantified for submittal to the Districts in the required Emissions Inventory Plan and Report.

AB 2588 further dictates that the Districts must evaluate air emissions from all reporting facilities and identify those that are prioritized as Category A facilities. A Category A facility is one whose emissions may have a significant impact on the area which surrounds it. Facilities that are identified as Category A are required to perform a risk assessment.

This document is the risk assessment for the Rohr, Inc. facility located in Chula Vista, California. It contains the results of the assessment, i.e. hazard identification, dose/response considerations, exposure assessment and risk characterization. The assessment has been prepared according to the requirements of the California Air Pollution Control Officers Association (CAPCOA) and San Diego Air Pollution Control District (APCD). The specific requirements of the APCD have been used along with CAPCOA guidelines for preparation of the assessment.

This risk is based upon the emissions submitted to the APCD in the Emission Inventory Report (EIR) dated November 2, 1990, the EIR Addendum dated February 6, 1991, and source test reports from the salt bath, the chemical milling and chromic acid anodize lines dated June 10, and June 29, 1992. This HRA was prepared in accordance with the District-approved and mandated Health Risk Assessment Protocols dated December 12 and January 10, 1991, and corrections to the calculation errors found in the original Protocols.

These emission estimates are coupled with air dispersion models to calculate ambient air concentrations of the emitted compounds using the ACE 2588 data reduction program. The calculated ambient concentrations are then used in accordance with the procedures detailed by the California Air Pollution Control Officers Association (CAPCOA) to arrive at a health-conservative estimate of increased individual cancer risk that might occur as a result of continuous exposure to the chemicals over a 70-year lifetime. In similar fashion, calculated concentrations of compounds with noncarcinogenic adverse health effects are used to calculate hazard indices (ratio of the calculated exposure to acceptable exposure).

The methodology and results of the air dispersion modeling and ACE 2588 data reduction program are discussed in Section 2 of this report and are displayed in Appendices B, C and D. Section 2.1 discusses the emission quantity estimates. Significant changes to the District-approved EIR and HRA Protocol were made for this assessment. However, based on Rohr records the new data are found to be more representative of potential emissions from the facility. The changes have been conducted and approved by the District both through written and verbal communications.

Section 2.3 of this report discusses the air dispersion modeling. The standard Industrial Source Complex model, with the Montgomery Field and Lindbergh Field meteorological station data provided by Trinity Consultants, was used to calculate the ambient concentration of emitted compounds (surface station #23188, upper air #03131). Copies of the model runs are included in Appendix B and Appendix C and IBM-compatible ASCII diskettes of the model input and results are included with this report.

Dose/response values used in the risk assessment are described in Section 3 of this report. The dose/response values published by CAPCOA in the AB 2588 Risk Assessment Guidelines dated January 1, 1991 were used without modification in the assessment. Section 4 of this report presents the results of the assessment. Isopleth maps of exposure are shown in Appendix D.

2 MODELING METHODOLOGY

2.1 Introduction and Emission Quantities

The Rohr, Inc. site is an aerospace industrial facility which manufactures airplane accessories and components. Emissions are related to principal processes such as metal surface treatment, metal forming, primary fabrication, assembly, surface coating, paint curing, degreasing, and welding. The chemicals emitted - as reported in the Emissions Inventory Report (EIR) and included in the District-approved HRA Protocol - that were considered in this assessment are arsenic, benzene, beryllium, cadmium, hexavalent chromium, copper, 1,4 dioxane, formaldehyde, glycol ethers, hydrochloric acid, hydrogen fluoride, isocyanates, lead, manganese, mercury, methanol, methyl chloroform, methylene chloride, nickel, perchloroethylene, selenium, sodium hydroxide, toluene, xylene, zinc, and phenol. The quantities emitted from each emitting device, maximum hourly and annual average rates, are shown in Appendix C of this report.

Significant changes to the reported emissions in the District-approved EIR and HRA Protocol were made during the preparation of this risk assessment. Based on Rohr records, the new data are found to be more representative of potential emissions from the facility, but in Rohr's opinion are still in excess of actual emissions. The changes have been conducted and approved by the District both through written and verbal communications. The District approved changes for the foundry crucibles, alodine aluminum line, and maskant dip tank and curing oven in a correspondence addressed to Rohr dated April 21, 1992. Kleinfelder submitted the revised HRA Protocol "Emissions and Release Parameters" forms to the District in a correspondence dated April 28, 1992. Thomas Weeks of the APCD confirmed the revised emission rates in a telephone conversation on May 1, 1992.

A summary of the changes is as follows. Lead and Kirksite throughput values were corrected for devices PFD01-03 and PFD06-07. In addition, a 10% conversion of chromium to hexavalent chromium in the Kirksite furnaces was incorporated into the emission rates (Source PFD01-03). Emissions of hexavalent chromium were assumed to be negligible for tank PAA01 in the alodine aluminum line because of a lack of emission mechanisms. Corrections in the maximum hourly solvent/thinner usage were incorporated resulting in changes in the maximum hourly release of perchloroethylene and toluene from

the maskant dip tank (PPD01) and curing oven (POV03). Further, source testing was performed for the chem milling line (PCM03 and PCM04), chrome anodize line (PAL04 and PAL05), and the heated salt bath (PHT01), and these new emission numbers were changed.

The revised emission rates are incorporated in the HRA. No other changes have been made to the HRA Protocol. That is, all other emission rates used are those found in the HRA Protocol.

A plot plan of the facility including the location of emitting points and plant boundaries is shown in Appendix D, Figure 1.

2.2 Facility Location and Surroundings

The Rohr facility is located in a commercial/industrial area immediately adjacent to Interstate Highway 5 in Chula Vista, California. The nearest residences are approximately 150 meters east of the facility. A map showing the surrounding area is included in Appendix D. A total of 234 census tract centroid locations were assessed for cancer burden by the impact of this facility. Sensitive receptors, i.e., schools and hospitals, were identified with the Thomas Brothers and USGS maps. The sensitive receptors identified by the Thomas Brothers and USGS maps are shown on the maps in Appendix D, Figure 6. Sensitive receptors were modeled following the methodology described in Section 2.3

2.3 Impact Modeling Methodology

In order to calculate the hypothetical maximum exposure of persons to emitted compounds, the ISCST simple terrain dispersion model and the COMPLEX1 complex terrain dispersion model were used. The ACE 2588 program, CAPCOA's data reduction and multipathway analyses program, was used in conjunction with the ISCST model to reduce the ISCST data. ISCST is a multi-source model that accepts point, area and volume emitting sources, and calculates ambient air concentrations for receptors on simple intermediate terrain. COMPLEX1 is a multi-source model that accepts only point sources, and is used to calculate ambient air concentrations for receptors located on intermediate and complex terrain.

Meteorological data from the Montgomery Field and Lindbergh Field meteorological stations, as provided by Trinity Consultants, were utilized in the model. No independent verification of the Trinity Consultant meteorological data was conducted. Three consecutive years of meteorological data (1985-1987) were used in a preliminary run to determine the data set that would result in the worst case risk and health hazard index values. It was determined that the meteorological data from 1986 was the worst case year (highest MEI cancer risk), and this data set was used throughout the study. The output from the model runs used to compare the three years is shown in Appendix B.

The model was run with all "regulatory default" switches set. The "rural" option was chosen to incorporate the more conservative rural dispersion coefficients (σ_y and σ_z). The Schulman-Scire building downwash option was implemented in ISCST. COMPLEX1 cannot address building downwash.

For point source emissions (i.e., stacks) identified in the EIR, the reported EIR and HRA Protocol emission characteristics (i.e., stack diameter, flow rate, height and exhaust gas temperature) were used without modification in ISCST. The fugitive emissions were treated as single effective volume sources equal to the smallest building volume containing the fugitive emissions. One fugitive source that was located outside was treated as an area source. Because of program limitations and the large number of sources at the facility, the sources were divided into two sets of input files; two runs were made for each receptor grid, and the results were combined to yield total ambient concentrations. Table 1 contains a complete listing of the sources.

The receptor grids used for the modeling performed are in accordance with the District-approved HRA Protocol. Receptors for ambient concentration calculations were placed on 14 grids with 50 meter spacing extending to a point 200 meters from facility boundary in all four directions (east, west, north and south). Beyond the 50-meter spaced "inner grid" is a second series of 37 grids with 100 meter spacing. These grids extend to one kilometer beyond the facility boundary in all four directions. A series of 10 receptor grids with 500 meter spacing were used beyond this point and extended until the 1E-05 cancer risk isopleth was captured. Figures 2 through 4 in Appendix D show the UTM locations of the receptors in each grid.

For the receptors located on intermediate terrain (elevations above the lowest stack height and below the highest plume rise), the complex terrain model COMPLEX1 was used for

comparison with ISCST results. Six sources accounting for 99.1% of the cancer risk at the MEI calculated by ISCST were modeled with COMPLEX1. Hexavalent chromium accounted for 98% of the MEI cancer risks. Therefore, hexavalent chromium emission rates from the six devices were coupled with the unit concentrations calculated by COMPLEX1 to determine ambient concentrations and cancer risks. The results showed that ISCST predicted higher concentrations and cancer risks at the MEI. Therefore, ISCST was used for the rest of the modeling in order to retain the more conservative (higher) concentration and cancer risk values. Table 2 shows the COMPLEX1/ISCST comparison.

For receptors on simple terrain (elevations lower than lowest stack height), only the ISCST program was used. The APCD requires that COMPLEX1 be used for receptors on complex terrain (elevations higher than the highest plume rise). However, no receptors used in this study lay on complex terrain.

Dispersion modeling was conducted assuming a unit emission rate of one gram per second for all devices. The modeling results provide, therefore, a relative concentration. Actual emission rates for each emitting source were input to the ACE 2588 model. The ACE 2588 model completes data reduction and provides the specific ground level concentrations per device, using the relative concentrations provided by the dispersion modeling output files. Both the annual average and maximum one-hour concentrations were calculated. Identification of the maximum exposure impact point was conducted using the ACE 2588 model. Copies of the dispersion model output results (relative concentrations) for the maximum impact point grid are provided in Appendix B. Calculated concentrations for each emitted compound are shown in Appendix C.

The worker (commercial) area concentrations are multiplied by a factor of 0.144 to adjust the exposure period. Per the CAPCOA Guidelines, the worker exposure period is 8 hours per day, 240 days per year for 46 years (as opposed to a 70 year lifetime residential exposure)

No background concentrations of pollutants were added to the model results (the background concentrations of chemicals not emitted by the facility are likely to indicate a risk much greater than that posed by the facility).

2.4 Building Downwash Considerations

Calculation of ground level concentrations by the dispersion model was performed to incorporate all representative building downwash parameters. A model was used that specifically produces direction-specific building dimensions for use in Schulman-Scire downwash algorithms. ISCST performs Schulman-Scire calculations where appropriate.

2.5 Exposed Population Data

The zone of impact is defined by the APCD to be a circle whose radius is from the facility to the farthest point on the $1E-06$ cancer risk isopleth. Because the distance from the Rohr facility to the farthest point on its $1E-06$ isopleth lies in Mexico, the distance from the facility to the farthest point of the $1E-06$ isopleth in the United States is used as the radius for the zone of impact. In accordance to the HRA Protocol and telephone conversations with APCD officers, a coarse grid (1 kilometer receptor spacing) was used to capture points on the $1E-06$ isopleth.

Census tract population data were obtained from the APCD (centroid locations). The impacted population estimates and calculated cancer burden are shown in Table 4. Cancer risks for centroid receptors were calculated following the methodology described in Section 2.3. The risk at each centroid was then multiplied by the appropriate population figure in each census tract to determine the cancer burden. The burden values for each tract were summed to obtain the total facility cancer burden.

3 DOSE/RESPONSE VALUES

3.1 DHS and EPA Cancer Potency Values

Table III-6 in the CAPCOA Risk Assessment Guidelines indicates those compounds for which the DHS and the US Environmental Protection Agency (EPA) have developed a unit risk value. Of the chemicals emitted at the Rohr facility, arsenic, benzene, beryllium, cadmium, hexavalent chromium, 1,4-dioxane, formaldehyde, methylene chloride, nickel, and perchloroethylene are listed in Table III-6 of the CAPCOA Guidelines. However, the ACE 2588 program considers the screening values for lead and isocyanates in the total cancer risk (i.e., the model does not break out the risk values for these two compounds). The values for Table III-6 compounds are shown as part of the ACE 2588 reduction data in Appendix C of this report.

3.2 CAPCOA Screening Cancer Potency Values

In addition to the potency values determined by DHS and EPA for the chemicals shown by CAPCOA in Table III-6, CAPCOA has reported screening potency values that can be used at District option. Values in this table include those for lead, isocyanates and selenium. Screening values for these compounds are listed in CAPCOA Table III-7 and are shown in Appendix C of this report. The screening potency values are considered overly conservative; generally they represent worst case unit risks for compounds that may be carcinogenic but require more experimentation to arrive at a representative unit risk value. Risk associated with screening potency values was not added to risk values generated with DHS and EPA cancer potency values, with the exception of lead and isocyanates. The screening cancer risk results are reported separately in Section 4 of this report.

3.3 Noncancer Acceptable Exposure Values

All of the emitted chemicals, with the exception of arsenic and 1,4-dioxane, also have potential noncancer health effects through chronic exposure. These effects may occur when persons are exposed to concentrations greater than the CAPCOA published noncancer acceptable exposure levels. Acceptable chronic (i.e., long term, annual average) and acute (i.e., short term, maximum hourly) exposure levels are shown in Tables III-8 and III-9 of the CAPCOA Guidelines. Only formaldehyde, hydrochloric acid, hydrogen

fluoride, lead, methylene chloride, and perchloroethylene have been assigned acceptable acute exposure levels. The acceptable levels are shown as part of the ACE 2588 output data file in Appendix C of this report.

3.4 Multipathway Analysis of Exposures

Persons can be exposed to some chemicals from pathways other than direct inhalation. These pathways include dermal exposure, water ingestion, crop ingestion and soil ingestion. Of the emitted chemicals from the Rohr facility, arsenic, beryllium, cadmium, hexavalent chromium, copper, formaldehyde, lead, manganese, mercury, methyl chloroform, methylene chloride, nickel, perchloroethylene, selenium, toluene, xylene, zinc, and phenol are subject to multipathway exposure (as shown in Table III-5 of the CAPCOA Guidelines). Results from the multipathway component are combined with inhalation pathway results by the ACE 2588 data reduction model and are shown in Appendix C of this report.

4 RESULTS OF ASSESSMENT

4.1 Carcinogenic Risk Results at Maximum Impact Point

The ACE 2588 data reduction modeling results contained in Appendix C display the emission rates of each chemical from the emitting devices/areas of the facility, the relative ambient concentration derived from the ISCST modeling at the point of maximum impact, the calculated concentration of each emitted chemical from each device, the unit cancer risk for each chemical, and the resultant maximum cancer risk from each chemical and device. Appendix C shows the total cancer risk for all devices and chemicals at the point of maximum exposure. Appendix C also displays the chemicals for which there are only CAPCOA screening potency values available.

The concentration of each chemical is calculated as shown in sample equations of Appendix A and is simply the product of the modeled ambient relative concentration determined from the ISCST model at the receptor of interest and the emission rate for that chemical and device. The cancer risk for each device and chemical is the product of the unit cancer risk obtained from the CAPCOA Guidelines times the calculated ambient concentration for that chemical and device.

The total maximum offsite hypothetical calculated individual cancer risk resulting from emissions of AB 2588 compounds at this facility is $1.660\text{E-}04$, located 200 meters east of the facility boundary in a residential area. This value is the risk for the maximum exposed individual (MEI). The maximum hypothetical calculated individual cancer risk for a commercial receptor is $6.047\text{E-}5$, at a location 25 meters east of the facility boundary. This risk incorporates the CAPCOA worker adjustment factor of 0.144 (the risk value is $4.199\text{E-}4$ without the worker factor). The MEI cancer risk is above the APCD significance level of $1\text{E-}05$.

The maximum risk for screening chemicals is $2.120\text{E-}10$, which is attributable to selenium emissions. The point of maximum risk for screening chemicals is located 200 meters east of the facility boundary.

4.2 Carcinogenic Impact Results Within Maximum Impact Zone

The dispersion modeling results of Appendix B and the ACE 2588 data reduction program results of Appendix C indicate that the maximum distance from the facility to the $1\text{E-}05$ risk isopleth is 5.24 kilometers southeast of the facility (Figure 5). The maximum distance from the facility to the $5\text{E-}05$ risk isopleth is 1.20 kilometers, and the maximum distance to the $1\text{E-}04$ risk isopleth is 0.60 kilometers southeast of the facility. The $1\text{E-}5$, $5\text{E-}05$, and $1\text{E-}04$ isopleths are shown in Figure 6.

Multiplying the calculated cancer risk at each census tract centroid within the zone of impact with the population within the census tract yields the excess cancer burden (as is shown in Table 4) in that tract. The sum of the census tract burden values is the facility excess cancer burden. The radius of the zone of impact as defined in Section 2.5 is 22 kilometers (Figure 5). The resulting cancer burden from emissions of all AB 2588 compounds for all potentially exposed centroid locations is 2.968 for residential population, and 0.250 for occupational population counts. The occupational cancer burden values take into account the worker adjustment factor of 0.144. That is, the calculated cancer risk is multiplied by 0.144 before being multiplied by the worker population in each census tract. A maximum calculated value is obtained for each centroid location (a receptor location) inside the zone of impact that is assumed to be representative of exposure for the total population found within that census tract.

The excess cancer burden for a population is an estimate of the possible increased number of cancer cases in a population as a result of a given exposure to emitted carcinogens. This estimate conservatively assumes that the entire population is exposed to that maximum value found at the associated centroid location. For any population unit the cancer burden is the product of the exposed population and the calculated individual risk from inhalation exposure and other pathways, where appropriate. Because of the conservative nature of the calculation of individual risk used in this document, this cancer burden is a maximum estimate. In other words, the number of predicted excess cancer cases is not expected to be higher than the calculated number and may very well be much lower.

Sensitive receptors (i.e., schools, hospitals, convalescent homes) within the zone of impact where the risk is greater than $1\text{E-}05$ for residences (i.e., risk not adjusted for worker exposure) are shown in Appendix D, Figure 6. Cancer risks and hazard indices at sensitive receptors are shown in Table 3.

4.3 Noncancer Impact Results

Appendix C displays the calculated noncancer impacts. The point of maximum noncarcinogenic chronic hazard index is located 10 meters east of the facility in a commercial area. The maximum chronic hazard index at this point is 0.269. The maximum chronic hazard index in a residential area is 0.093. This value incorporates the CAPCOA worker adjustment factor of 0.144 (the hazard index value is 1.6 without the worker factor). The target organ with the maximum chronic hazard index is the liver. The maximum acute hazard index of 0.499 occurs approximately 10 meters west of the facility in a unincorporated shoreline area. Neither the maximum chronic or acute hazard indices exceed the APCD significance level of 1.0 (Figure 6).

4.4 Summary

The calculated potential cancer and noncancer impacts for compounds for which potency levels are established exceed the significance levels of $1E-05$ for cancer risk, but not the 1.0 level set for the hazard index.

The calculated carcinogenic risk and hazard indices indicate that the facility poses a significant risk according to APCD guidelines. It should be noted that the calculated values are based upon required APCD and CAPCOA conservative assumptions. Therefore, the actual values would be significantly lower than the calculated values derived in this report, even approaching zero.

5 LIMITATIONS

This report was prepared in general accordance with the accepted standard of care that existed in Southern California at the time the report was written. It should be recognized that determining all possible emission scenarios and substances is difficult. Judgments leading to the conclusions and recommendations are generally made with an incomplete knowledge of the facility. Kleinfelder should be notified for additional consultation if the client wishes to reduce the uncertainties beyond the level associated with this report. No warranty, expressed or implied, is made.

This report may be used only by Rohr and the San Diego Air Pollution Control District and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than Rohr who wishes to use this report shall notify Kleinfelder of such intended use. Based upon the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Noncompliance with any of these requirements by Kleinfelder or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

Table 1 - Sources

Source Group A Source Number	Grouped Devices	Actual Device
1	SNG04	
2	SNG09	
3	SNG10	
4	SNG11	
5	SNG12	
6	SNG13	
7	SNG14	
8	SNG15	
9	SNG16	
10	SNG17	
11	SNG19	
12	SPB04	
13	SPB05	
14	SPB06	
15	SPB19	
16	SPB25	
17	SPB26	
18	SPB27	
19	SPB28	
20	SPB29	
21	SPB30	
22	SPB31	
23	SPB32	
24	SPB33	
25	SPB34	
26	SPB35	
27	SPB36	
28	SPB37	
29	SPB38	
30	SPB39	
31	SPB45	
32	SOV01	
33	SOV08	
34	SOV13	
35	SOV09	
36	BLDG 1A	PBF01 PDG25 PDG26 PDG27 PDG28 PDG29
37	BLDG 1B	PDG02 PDG03 PWL01
38	SPD01	
39	BLDG 5	PDG04
40	BLDG 36	PDG05

Source Group B Source Number	Grouped Devices	Actual Device
1	BLDG 45A	PDG06 PDG07
2	BLDG 45B	PDG08 PTS03
3	BLDG 443	PDG09
4	BLDG 912	PDG10
5	SDG01	
6	BLDG 452	PDG12
7	BLDG 48	PDG16 PDG17
8	BLDG 910	PDG20
9	PDG30	PDG22 PDG33 PBF04
10	BLDG 3	PDG21 PBF02
11	BLDG 30	PDG22 PDG33 PBF04
12	BLDG 911	PDG33
13	BLDG 34	PDG34
14	BLDG 61	PBF06
15	PCT01	
16	PCT03	
17	PCT04	
18	PCT05	
19	PCT06	
20	PCT08	
21	PCT12	
22	AL02	
23	SAA01	
24	SCN01	
25	SCM01	
26	SCM02	
27	SCM03	
28	SCM04	
29	SPA02	
30	SHT01	
31	SFD07	
32	SFD01	
33	SFD02	
34	SFD03	
35	SFD06	
36	SGT01	
37	SGT02	

COMPLEX1 - ISCST Comparison

Table 2

#22 - SAL02	Calculated
Receptor	Concentration
MEI	4.901E-04

#23 - SAA01	
Receptor	
MEI	5.346E-05

#24 - SCN01	
Receptor	
MEI	7.673E-06

	COMPLEX1	97.1% ISCST
Receptor	Risk	Risk
MEI	7.717E-05	3.493E-04

Table 3 - Health Hazards for Sensitive Receptors

Sensitive Receptor	UTM X (m)	UTM Y (m)	Cancer Risk	Acute HHI	Chronic CV HHI	Chronic CNS HHI
Mueller School	491300	3609700	5.093E-05	1.550E-01	1.089E-03	1.827E-01
Vista Square School	491900	3610600	1.661E-05	7.649E-01	1.456E-03	1.741E-01
Vista Square JHS	492100	3610600	1.325E-05	5.927E-01	1.139E-03	1.423E-01
Boys' Club	492250	3609950	1.779E-05	5.187E-01	2.087E-03	2.048E-01
Chula Vista HS	492750	3609150	2.599E-05	5.388E-01	2.547E-03	2.623E-01
Rice School	493050	3608950	6.833E-06	4.106E-01	9.079E-05	2.162E-01
Chula Vista Hospital	493400	3608700	2.018E-05	3.646E-01	1.730E-03	1.957E-01
St. Rose Lima School	492850	3610650	7.730E-06	2.990E-01	5.890E-04	6.878E-01
Bay General Hospital	492150	3610500	1.347E-05	4.672E-01	1.084E-03	1.330E-01
Community Hospital	491600	3611000	1.801E-05	7.481E-01	1.689E-03	1.856E-01
Feaster School	491000	3610350	7.327E-05	3.946E-01	1.019E-02	1.405E-01
Harborside School	492000	3607700	2.109E-05	6.128E-01	1.092E-03	1.626E-01

Sensitive Receptor	UTM X (m)	UTM Y (m)	Chronic Immun HHI	Chronic Kidney HHI	Chronic Liver HHI	Chronic Repro HHI	Chronic Resp HHI
Mueller School	491300	3609700	2.294E-02	2.505E-02	1.823E-01	3.736E-03	1.711E-01
Vista Square School	491900	3610600	1.606E-03	4.688E-03	1.731E-01	1.511E-03	2.426E-01
Vista Square JHS	492100	3610600	1.267E-03	3.742E-03	1.416E-01	1.186E-03	1.979E-01
Boys' Club	492250	3609950	2.251E-03	5.788E-03	2.035E-01	2.147E-03	2.640E-01
Chula Vista HS	492750	3609150	2.832E-03	7.478E-03	2.605E-01	2.636E-03	3.818E-01
Rice School	493050	3608950	1.014E-04	3.191E-03	2.158E-01	9.483E-05	3.440E-01
Chula Vista Hospital	493400	3608700	1.907E-03	5.467E-03	1.945E-01	1.796E-03	2.952E-01
St. Rose Lima School	492850	3610650	6.714E-04	1.988E-03	6.865E-01	6.160E-04	1.125E-01
Bay General Hospital	492150	3610500	1.214E-03	3.576E-03	1.322E-01	1.132E-03	1.969E-01
Community Hospital	491600	3611000	1.865E-03	5.247E-03	1.846E-01	1.746E-03	2.717E-01
Feaster School	491000	3610350	2.315E-02	2.692E-02	1.326E-01	1.222E-02	1.269E-01
Harborside School	492000	3607700	1.277E-03	4.447E-03	1.618E-01	1.171E-03	3.034E-01

Table 4 - Census Tract Risks and Cancer Burden

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
1.00	482700	3623700	4.678E-07	3636	495	1.701E-03	2.316E-04	3.334E-05
2.00	483600	3623000	4.696E-07	6813	1953	3.199E-03	9.171E-04	1.321E-04
3.00	484800	3622700	5.657E-07	4949	4079	2.800E-03	2.307E-03	3.323E-04
4.00	484800	3623500	5.050E-07	3325	9619	1.679E-03	4.858E-03	6.995E-04
5.00	485900	3624500	4.635E-07	3190	2325	1.479E-03	1.078E-03	1.552E-04
6.00	485800	3623500	5.431E-07	3216	2307	1.747E-03	1.253E-03	1.804E-04
7.00	485800	3622700	5.674E-07	3594	892	2.039E-03	5.061E-04	7.288E-05
8.00	486700	3622700	5.253E-07	4403	225	2.313E-03	1.182E-04	1.702E-05
9.00	486700	3623500	4.672E-07	4710	1381	2.201E-03	6.452E-04	9.291E-05
10.00	486700	3624300	4.447E-07	4578	933	2.036E-03	4.149E-04	5.975E-05
11.00	487500	3624800	6.173E-07	2960	1333	1.827E-03	8.229E-04	1.185E-04
12.00	487600	3624200	6.468E-07	4038	1695	2.612E-03	1.096E-03	1.579E-04
13.00	487600	3623500	6.505E-07	4133	2537	2.689E-03	1.650E-03	2.376E-04
14.00	487500	3622700	6.149E-07	2847	1574	1.751E-03	9.679E-04	1.394E-04
15.00	488400	3622500	8.789E-07	3597	548	3.161E-03	4.816E-04	6.936E-05
16.00	488600	3223600	4.161E-08	3615	1061	1.504E-04	4.415E-05	6.357E-06
17.00	488600	3624200	8.193E-07	4099	472	3.358E-03	3.867E-04	5.569E-05
18.00	488900	3624700	8.596E-07	5149	1173	4.426E-03	1.008E-03	1.452E-04
19.00	488800	3625300	8.107E-07	3476	107	2.818E-03	8.674E-05	1.249E-05
20.01	490100	3625300	8.137E-07	3488	899	2.838E-03	7.315E-04	1.053E-04
20.02	491400	3624700	7.405E-07	2495	57	1.848E-03	4.221E-05	6.078E-06
21.00	489800	3624300	9.217E-07	4860	1426	4.479E-03	1.314E-03	1.893E-04
22.00	489700	3623500	1.011E-06	6009	2157	6.074E-03	2.180E-03	3.140E-04
23.00	490900	3623500	8.757E-07	5401	2202	4.730E-03	1.928E-03	2.777E-04
24.00	489700	3622900	1.079E-06	6340	1208	6.842E-03	1.304E-03	1.877E-04
25.01	489800	3622300	1.146E-06	3999	141	4.581E-03	1.615E-04	2.326E-05
25.02	489900	3620800	1.369E-06	5193	927	7.109E-03	1.269E-03	1.827E-04
26.00	490800	3622400	1.003E-06	8184	680	8.212E-03	6.823E-04	9.825E-05
27.01	491800	3623600	8.153E-07	6684	1102	5.449E-03	8.985E-04	1.294E-04
27.02	493100	3623800	5.921E-07	3624	2041	2.146E-03	1.208E-03	1.740E-04
27.03	493600	3622800	6.683E-07	5406	1042	3.613E-03	6.964E-04	1.003E-04
27.04	491800	3622600	8.883E-07	5242	485	4.656E-03	4.308E-04	6.204E-05
27.05	492100	3621400	8.730E-07	3080	297	2.689E-03	2.593E-04	3.734E-05
27.06	492800	3621200	7.651E-07	6102	2908	4.669E-03	2.225E-03	3.204E-04
28.01	492300	3626000	6.121E-07	3740	6352	2.289E-03	3.888E-03	5.599E-04
28.02	492600	3624900	5.916E-07	8555	1698	5.061E-03	1.005E-03	1.447E-04
29.01	494400	3625700	7.001E-07	9875	6294	6.913E-03	4.406E-03	6.345E-04
29.02	494300	3624400	7.494E-07	4639	1318	3.476E-03	9.877E-04	1.422E-04
29.03	494900	3623300	7.106E-07	3281	898	2.331E-03	6.381E-04	9.189E-05
30.01	492900	3619600	6.244E-07	4812	393	3.005E-03	2.454E-04	3.534E-05
30.02	494400	3620100	6.384E-07	7889	1541	5.036E-03	9.838E-04	1.417E-04
31.01	492400	3617500	6.813E-07	3633	80	2.475E-03	5.450E-05	7.849E-06

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
31.02	493600	3617600	6.817E-07	3633	80	2.477E-03	5.454E-05	7.853E-06
31.03	495700	3618500	7.124E-07	10763	997	7.668E-03	7.103E-04	1.023E-04
31.04	495400	3616900	6.509E-07	6098	253	3.969E-03	1.647E-04	2.371E-05
31.05	497000	3618900	5.648E-07	9554	805	5.396E-03	4.547E-04	6.547E-05
31.07	497700	3618100	4.882E-07	5635	231	2.751E-03	1.128E-04	1.624E-05
31.08	498500	3618500	4.419E-07	3450	415	1.525E-03	1.834E-04	2.641E-05
32.01	494200	3615800	7.063E-07	5441	248	3.843E-03	1.752E-04	2.522E-05
32.02	493800	3614400	7.314E-07	4137	174	3.026E-03	1.273E-04	1.833E-05
32.03	494700	3614700	7.350E-07	7739	547	5.688E-03	4.020E-04	5.789E-05
32.04	494300	3612700	4.113E-08	3792	1332	1.560E-04	5.479E-05	7.889E-06
32.06	496600	3616100	5.998E-07	16126	1215	9.672E-03	7.288E-04	1.049E-04
32.07	496800	3614600	5.725E-07	5250	582	3.006E-03	3.332E-04	4.798E-05
33.00	490900	3617700	7.434E-07	10038	2006	7.462E-03	1.491E-03	2.147E-04
34.01	491400	3620500	7.019E-07	4858	1436	3.410E-03	1.008E-03	1.451E-04
34.02	488900	3619200	8.598E-07	8033	3194	6.907E-03	2.746E-03	3.955E-04
35.00	489100	3618000	9.222E-07	6187	523	5.706E-03	4.823E-04	6.945E-05
36.00	489400	3616600	1.021E-06	9894	3018	1.010E-02	3.082E-03	4.438E-04
38.00	488500	3616100	8.393E-07	15685	27356	1.316E-02	2.296E-02	3.306E-03
39.00	488000	3617600	7.699E-07	8150	2106	6.275E-03	1.621E-03	2.335E-04
40.00	487900	3618700	7.495E-07	3633	472	2.723E-03	3.538E-04	5.094E-05
41.00	488100	3619400	8.317E-07	5086	2345	4.230E-03	1.950E-03	2.808E-04
42.00	488800	3621000	9.692E-07	6343	654	6.148E-03	6.339E-04	9.128E-05
43.00	487800	3621600	7.039E-07	4149	186	2.920E-03	1.309E-04	1.885E-05
44.00	487800	3620400	6.989E-07	4133	763	2.889E-03	5.333E-04	7.679E-05
45.00	487000	3619300	5.084E-07	4702	831	2.390E-03	4.225E-04	6.084E-05
46.00	486400	3619400	5.800E-07	2137	1314	1.239E-03	7.621E-04	1.097E-04
47.00	486400	3618600	6.703E-07	2197	721	1.473E-03	4.833E-04	6.959E-05
48.00	487000	3618700	6.594E-07	3775	1115	2.489E-03	7.352E-04	1.059E-04
49.00	487000	3617900	5.104E-07	3893	936	1.987E-03	4.777E-04	6.879E-05
50.00	486800	3617300	4.606E-07	1875	4081	8.636E-04	1.880E-03	2.707E-04
51.00	485500	3618400	8.844E-07	1773	7109	1.568E-03	6.287E-03	9.054E-04
52.00	485700	3619400	7.345E-07	2424	5082	1.780E-03	3.733E-03	5.375E-04
53.00	484800	3625300	4.415E-07	5561	39477	2.455E-03	1.743E-02	2.510E-03
54.00	484300	3618900	6.684E-07	1526	19343	1.020E-03	1.293E-02	1.862E-03
55.00	486300	3620400	7.112E-07	754	6160	5.362E-04	4.381E-03	6.309E-04
56.00	485000	3620100	6.715E-07	1964	5471	1.319E-03	3.674E-03	5.290E-04
57.00	484800	3620500	6.347E-07	1693	3062	1.075E-03	1.943E-03	2.799E-04
58.00	484200	3620500	6.687E-07	931	7002	6.226E-04	4.682E-03	6.742E-04
59.00	484600	3621000	5.912E-07	2598	2099	1.536E-03	1.241E-03	1.787E-04
60.00	484600	3621700	5.519E-07	3374	4895	1.862E-03	2.702E-03	3.890E-04
61.00	483700	3621700	5.847E-07	2388	1946	1.396E-03	1.138E-03	1.638E-04
62.00	482400	3621200	5.084E-07	30	13216	1.525E-05	6.719E-03	9.675E-04
63.00	481500	3622300	4.517E-07	4388	6628	1.982E-03	2.994E-03	4.311E-04

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
64.00	479800	3621300	5.304E-07	10957	15282	5.812E-03	8.106E-03	1.167E-03
65.00	481700	3623500	3.843E-07	2697	21005	1.036E-03	8.072E-03	1.162E-03
66.00	480800	3622700	4.239E-07	1669	2789	7.075E-04	1.182E-03	1.702E-04
68.00	470300	3623400	2.814E-07	7025	2519	1.977E-03	7.088E-04	1.021E-04
69.00	477000	3623300	3.764E-07	5240	1086	1.972E-03	4.088E-04	5.886E-05
70.01	478700	3621100	3.636E-07	4510	3136	1.640E-03	1.140E-03	1.642E-04
70.02	477800	3621400	3.083E-07	3092	423	9.533E-04	1.304E-04	1.878E-05
71.00	477500	3619600	5.264E-07	5376	3140	2.830E-03	1.653E-03	2.380E-04
72.00	475700	3646300	1.342E-07	5394	1167	7.239E-04	1.566E-04	2.255E-05
73.01	476500	3622300	2.849E-07	4869	274	1.387E-03	7.806E-05	1.124E-05
73.02	477100	3621700	3.106E-07	2116	207	6.572E-04	6.429E-05	9.258E-06
74.00	477700	3622800	4.257E-07	6190	670	2.635E-03	2.852E-04	4.107E-05
75.00	477000	3623200	3.640E-07	7092	2203	2.581E-03	8.019E-04	1.155E-04
76.00	477600	3626800	2.855E-07	7138	5428	2.038E-03	1.550E-03	2.232E-04
77.00	477800	3627800	2.774E-07	7073	612	1.962E-03	1.698E-04	2.445E-05
78.00	479100	3629600	3.028E-07	7174	3792	2.172E-03	1.148E-03	1.653E-04
85.09	483900	3630500	2.924E-07	6976	1830	2.040E-03	5.351E-04	7.705E-05
85.10	484800	3629900	2.713E-07	6381	878	1.731E-03	2.382E-04	3.430E-05
85.11	486800	3631600	4.264E-07	1230	77127	5.245E-04	3.289E-02	4.736E-03
85.12	482600	3630000	2.943E-07	4458	404	1.312E-03	1.189E-04	1.712E-05
85.13	483100	3629400	3.165E-07	3125	551	9.891E-04	1.744E-04	2.511E-05
86.00	483600	3628100	3.463E-07	5611	1134	1.943E-03	3.927E-04	5.655E-05
87.01	484800	3628600	3.126E-07	3252	752	1.017E-03	2.351E-04	3.385E-05
87.02	485500	3628100	3.121E-07	5180	6450	1.617E-03	2.013E-03	2.899E-04
88.00	484500	3627100	3.965E-07	8210	691	3.255E-03	2.740E-04	3.945E-05
89.00	483900	3625900	3.999E-07	9255	16011	3.701E-03	6.403E-03	9.220E-04
90.00	483600	3626400	3.862E-07	3670	334	1.417E-03	1.290E-04	1.857E-05
91.01	480900	3628800	2.915E-07	6253	1225	1.826E-03	3.571E-04	5.142E-05
91.02	481700	3629400	3.238E-07	2664	789	8.626E-04	2.555E-04	3.679E-05
91.03	481600	3627500	3.211E-07	3868	1083	1.242E-03	3.478E-04	5.008E-05
91.04	481400	3626700	3.427E-07	3098	705	1.062E-03	2.416E-04	3.479E-05
91.05	481700	3625400	4.034E-07	6950	7264	2.804E-03	2.930E-03	4.220E-04
92.01	486400	3628800	4.159E-07	5745	1642	2.389E-03	6.829E-04	9.834E-05
92.02	486500	3627800	4.285E-07	4710	694	2.018E-03	2.974E-04	4.282E-05
93.01	487400	3628900	5.168E-07	4387	2796	2.267E-03	1.445E-03	2.081E-04
93.03	488200	3628500	6.042E-07	6077	2890	3.672E-03	1.746E-03	2.514E-04
93.04	486300	3626000	3.873E-07	6063	18079	2.348E-03	7.002E-03	1.008E-03
95.01	489900	3630300	5.582E-07	15435	2348	8.616E-03	1.311E-03	1.387E-04
95.02	489900	3632500	4.851E-07	3774	646	1.831E-03	3.134E-04	4.513E-05
95.03	491500	3631700	4.432E-07	16023	1903	7.101E-03	8.434E-04	1.215E-04
96.02	491900	3628500	5.529E-07	4195	1489	2.319E-03	8.233E-04	1.186E-04
96.03	490200	3627200	6.882E-07	4227	5549	2.909E-03	3.819E-03	5.499E-04
96.04	491300	3627600	5.854E-07	3898	6288	2.282E-03	3.681E-03	5.301E-04

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
97.03	493000	3628400	4.480E-07	4034	450	1.807E-03	2.016E-04	2.903E-05
97.04	494600	3629700	3.497E-07	7274	830	2.544E-03	2.903E-04	4.180E-05
97.05	493400	3627400	4.508E-07	4026	323	1.815E-03	1.456E-04	2.097E-05
97.06	494600	3627800	4.187E-07	7631	1186	3.195E-03	4.966E-04	7.151E-05
98.01	497200	3628400	4.311E-07	4931	1239	2.126E-03	5.341E-04	7.692E-05
98.02	498500	3628400	4.187E-07	6550	1076	2.742E-03	4.505E-04	6.488E-05
98.04	498800	3629800	3.894E-07	6110	518	2.379E-03	2.017E-04	2.905E-05
98.05	495500	3630100	3.964E-07	4312	625	1.709E-03	2.478E-04	3.568E-05
99.01	477200	3617900	6.284E-07	1111	11290	6.982E-04	7.095E-03	1.022E-03
99.02	483100	3620200	5.678E-07	0	0	0.000E+00	0.000E+00	0.000E+00
100.01	494500	3605000	6.832E-06	3575	537	2.442E-02	3.669E-03	5.283E-04
100.02	494100	3604100	4.976E-06	9027	818	4.492E-02	4.070E-03	5.861E-04
100.03	495700	3604100	5.031E-06	5831	193	2.934E-02	9.710E-04	1.398E-04
100.04	494800	3603200	4.072E-06	4910	236	1.999E-02	9.610E-04	1.384E-04
100.05	495100	3602300	3.377E-06	7452	1528	2.517E-02	5.160E-03	7.430E-04
100.06	494900	3601100	2.683E-06	10837	2354	2.908E-02	6.316E-03	9.095E-04
100.07	496300	3600900	2.684E-06	11014	9814	2.956E-02	2.634E-02	3.793E-03
101.03	490800	3605800	1.246E-05	4266	744	5.316E-02	9.271E-03	1.335E-03
101.04	490700	3602800	6.335E-06	3529	60	2.236E-02	3.801E-04	5.473E-05
101.05	492100	3602700	5.067E-06	13854	899	7.020E-02	4.555E-03	6.560E-04
101.06	493100	3602800	4.405E-06	6426	1537	2.831E-02	6.770E-03	9.749E-04
101.07	492400	3604700	7.083E-06	5175	682	3.665E-02	4.831E-03	6.956E-04
102.00	488300	3603500	2.847E-06	7883	1331	2.244E-02	3.789E-03	5.457E-04
103.00	489100	3603800	4.175E-06	4653	303	1.943E-02	1.265E-03	1.822E-04
104.00	489800	3603800	4.366E-06	7166	312	3.129E-02	1.362E-03	1.962E-04
105.00	488800	3605000	3.997E-06	6539	1865	2.614E-02	7.454E-03	1.073E-03
106.01	487300	3609200	3.720E-06	1696	449	6.309E-03	1.670E-03	2.405E-04
106.02	484800	3614900	1.072E-06	2085	2966	2.236E-03	3.180E-03	4.579E-04
106.03	483600	3615100	1.187E-06	929	205	1.102E-03	2.433E-04	3.503E-05
107.00	482900	3616000	9.721E-07	1302	3629	1.266E-03	3.528E-03	5.080E-04
108.00	482800	3616700	6.818E-07	3129	846	2.133E-03	5.768E-04	8.306E-05
109.00	483600	3616200	7.326E-07	1912	482	1.401E-03	3.531E-04	5.085E-05
110.00	484000	3617100	8.770E-07	2648	1407	2.322E-03	1.234E-03	1.777E-04
111.00	483200	3617500	8.971E-07	4136	377	3.710E-03	3.382E-04	4.870E-05
112.00	482200	3617000	6.886E-07	1198	56	8.249E-04	3.856E-05	5.553E-06
113.00	481100	3617900	5.963E-07	6701	33555	3.996E-03	2.001E-02	2.881E-03
114.00	489200	3614700	2.170E-06	12268	15190	2.662E-02	3.296E-02	4.747E-03
115.00	489700	3612900	4.409E-06	315	6798	1.389E-03	2.997E-02	4.316E-03
116.00	490900	3613500	5.448E-06	7462	1930	4.065E-02	1.051E-02	1.514E-03
117.00	490800	3614700	3.819E-06	5211	4344	1.990E-02	1.659E-02	2.389E-03
118.00	490800	3615600	2.989E-06	8371	1076	2.502E-02	3.216E-03	4.631E-04
119.00	492000	3616400	1.672E-06	6285	1997	1.051E-02	3.339E-03	4.808E-04
120.00	492500	3615200	2.479E-06	7591	1201	1.882E-02	2.977E-03	4.287E-04

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
121.00	492000	3614200	3.487E-06	4738	800	1.652E-02	2.790E-03	4.017E-04
122.00	493000	3613600	3.121E-06	3185	784	9.940E-03	2.447E-03	3.523E-04
123.01	493000	3611800	5.687E-06	5655	1202	3.216E-02	6.836E-03	9.844E-04
123.02	492300	3611100	1.045E-05	1025	1526	1.071E-02	1.594E-02	2.295E-03
124.01	491500	3612300	8.027E-06	2498	1985	2.005E-02	1.593E-02	2.294E-03
124.02	491600	3611300	1.291E-05	3866	1811	4.989E-02	2.337E-02	3.366E-03
125.00	489700	3610900	1.190E-05	6090	3137	7.244E-02	3.731E-02	5.373E-03
126.00	491100	3609000	7.257E-05	4121	6277	2.991E-01	4.555E-01	6.560E-02
127.00	491300	3610300	4.506E-05	3747	4283	1.688E-01	1.930E-01	2.779E-02
128.00	493200	3610600	7.010E-06	3218	386	2.256E-02	2.706E-03	3.896E-04
129.00	493400	3609500	1.043E-05	2884	952	3.007E-02	9.927E-03	1.430E-03
130.00	491900	3609300	6.983E-05	4399	2676	3.072E-01	1.869E-01	2.691E-02
131.01	491300	3507700	2.966E-05	4638	3679	1.376E-01	1.091E-01	1.571E-02
131.02	493600	3608300	2.012E-05	4987	1885	1.003E-01	3.793E-02	5.461E-03
132.01	492400	3606300	1.003E-05	5405	3899	5.420E-02	3.910E-02	5.630E-03
132.02	493700	3606600	1.208E-05	6873	2226	8.301E-02	2.689E-02	3.872E-03
133.01	495000	3609200	5.937E-06	4498	287	2.670E-02	1.704E-03	2.454E-04
133.02	495300	3608200	8.805E-06	4352	191	3.832E-02	1.682E-03	2.422E-04
133.03	495100	3607300	1.148E-05	4432	551	5.090E-02	6.328E-03	9.112E-04
133.04	495200	3606300	1.074E-05	9688	1287	1.040E-01	1.382E-02	1.990E-03
133.05	496800	3607500	5.770E-06	11963	2549	6.903E-02	1.471E-02	2.118E-03
134.01	494300	3610300	4.199E-06	4257	859	1.788E-02	3.607E-03	5.194E-04
134.03	499100	3611200	1.159E-06	22277	4142	2.581E-02	4.799E-03	6.911E-04
134.04	499100	3613600	9.379E-07	24475	1102	2.296E-02	1.034E-03	1.488E-04
135.01	501800	3621500	4.725E-07	9042	2013	4.272E-03	9.511E-04	1.370E-04
135.02	503000	3621500	5.301E-07	8109	2382	4.299E-03	1.263E-03	1.818E-04
136.01	502100	3623500	3.780E-07	6146	1045	2.323E-03	3.950E-04	5.688E-05
136.02	505400	3623500	4.338E-07	12532	2893	5.436E-03	1.255E-03	1.80E-04
137.00	500400	3622200	4.710E-07	6480	2019	3.052E-03	9.509E-04	1.369E-04
138.00	498900	3631500	3.570E-07	6406	1272	2.287E-03	4.541E-04	6.539E-05
139.01	499100	3620200	5.730E-07	8997	1160	5.155E-03	6.647E-04	9.571E-05
139.02	500300	3618900	7.367E-07	10274	1659	7.569E-03	1.222E-03	1.760E-04
139.03	499700	3618100	8.265E-07	4150	997	3.430E-03	8.240E-04	1.187E-04
140.01	497500	3621700	5.697E-07	4836	977	2.755E-03	5.566E-04	8.015E-05
140.02	498100	3620400	7.342E-07	4195	966	3.080E-03	7.092E-04	1.021E-04
141.00	496500	3619800	7.363E-07	6783	444	4.994E-03	3.269E-04	4.708E-05
142.00	495900	3620600	7.402E-07	6417	1339	4.750E-03	9.911E-04	1.427E-04
143.00	496100	3621700	7.015E-07	2929	138	2.055E-03	9.681E-05	1.394E-05
144.00	496900	3622400	5.814E-07	3325	4826	1.933E-03	2.806E-03	4.040E-04
145.00	495700	3623300	6.703E-07	3388	391	2.271E-03	2.621E-04	3.774E-05
146.00	497400	3624200	5.186E-07	8746	4493	4.536E-03	2.330E-03	3.355E-04
147.00	496000	3624600	5.893E-07	7050	1449	4.155E-03	8.539E-04	1.230E-04
148.01	495800	3626100	5.239E-07	6732	3748	3.527E-03	1.964E-03	2.828E-04

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
148.03	497700	3626400	4.853E-07	4620	4134	2.242E-03	2.006E-03	2.889E-04
148.04	497100	3627400	4.686E-07	4672	783	2.189E-03	3.669E-04	5.284E-05
149.00	498800	3625000	4.166E-07	6738	4554	2.807E-03	1.897E-03	2.732E-04
150.00	499100	3627000	3.819E-07	5588	7218	2.134E-03	2.757E-03	3.969E-04
151.00	500300	3627600	3.314E-07	4421	758	1.465E-03	2.512E-04	3.617E-05
152.00	500900	3625500	4.572E-07	4187	1039	1.914E-03	4.750E-04	6.840E-05
153.01	503900	3627100	3.135E-07	2679	251	8.399E-04	7.869E-05	1.133E-05
153.02	502700	3625900	3.593E-07	4140	551	1.488E-03	1.980E-04	2.851E-05
154.02	507500	3626200	3.359E-07	8880	371	2.983E-03	1.246E-04	1.795E-05
154.03	504800	3625300	3.100E-07	4573	349	1.418E-03	1.082E-04	1.558E-05
154.04	505700	3626500	2.782E-07	6761	719	1.881E-03	2.000E-04	2.880E-05
158.00	503600	3627900	3.419E-07	6202	5849	2.120E-03	2.000E-03	2.880E-04
159.00	502800	3627100	3.796E-07	7005	1325	2.659E-03	5.030E-04	7.243E-05
160.00	501800	3627400	3.828E-07	2406	4460	9.210E-04	1.707E-03	2.458E-04
161.00	500900	3628800	3.052E-07	5951	1130	1.816E-03	3.449E-04	4.966E-05
162.01	500900	3629300	3.038E-07	7141	3129	2.169E-03	9.506E-04	1.369E-04
162.02	502700	3630200	2.826E-07	3097	20921	8.752E-04	5.912E-03	8.514E-04
166.05	498600	3631900	3.458E-07	6505	1273	2.249E-03	4.402E-04	6.339E-05
213.00	510000	3621000	2.630E-07	10388	2225	2.732E-03	5.852E-04	8.427E-05
TOTALS:				1274103	738550	2.968	1.737	0.250

* Note: Adj. Occ. indicates occupational population cancer burden that has been adjusted with worker adjustment factor (0.144).

APPENDIX A-1: RISK ESTIMATES

1. Model all emission points at 1 gram/second emission rate. This yields the "relative concentration."
2. For example, the modeled benzene concentration at the maximum impact point is $2.597\text{E-}02 \text{ ug/m}^3$ ($2.707\text{E-}03 \text{ ug/m}^3$ from run A and $2.326\text{E-}02 \text{ ug/m}^3$ from run B).
3. Multiply the device and chemical-specific concentration by the unit risk factor (multiply the concentration by 0.144 for worker areas). For example, the unit risk for benzene is $2.9\text{E-}05 \text{ m}^3/\text{ug}$; then for the maximum exposed residence:

$$2.597\text{E-}02 \text{ ug/m}^3 \times 2.9\text{E-}05 \text{ m}^3/\text{ug} = 7.530\text{E-}07$$

4. Sum each device and chemical specific risk to get a total risk.

APPENDIX A-2: HAZARD INDEX ESTIMATES

1. Determine the maximum concentration for each device-chemical combination as shown in risk estimate calculation (Appendix A-1). For acute exposure, use hourly concentrations. For chronic use annual average.
2. Divide the calculated concentration by the acceptable exposure level. This is the hazard index.
3. For example, for benzene emissions, the calculated concentration (annual average) is $2.597\text{E-}02 \text{ ug/m}^3$; the chronic acceptable inhalation level is 71 ug/m^3 ; the chronic hazard index is:

$$\frac{2.597\text{E-}02 \text{ ug/m}^3}{71 \text{ ug/m}^3} = 3.658\text{E-}04$$

4. Add together all hazard indices that impact the same target organs or systems.
5. For the chronic hazard index, a worker exposure adjustment factor of 0.144 is used.

APPENDIX A-3: EXPOSED POPULATION ESTIMATES

1. Determine location and population for each centroid (data provided by APCD).
2. Determine maximum potential cancer risk for receptor at centroid location by running dispersion and ACE 2588 models.
3. Multiply the number of persons (represented by centroid location) by the maximum potential risk found at that centroid receptor location. For occupational cancer burden, multiply the risk by a factor of 0.144.

For example: Census Tract 1.00 (482700, 3623700)

- a) Residential Population = 3636
Maximum cancer risk = 4.678E-07
Cancer Burden: $3636 \times 4.678\text{E-}07 = 1.701\text{E-}03$
- b) Occupational Population = 495
Maximum cancer risk = 4.678E-07
Cancer Burden: $495 \times 4.678\text{E-}07 \times 0.144 = 3.334\text{E-}05$

Figure 2. 50m receptor grids

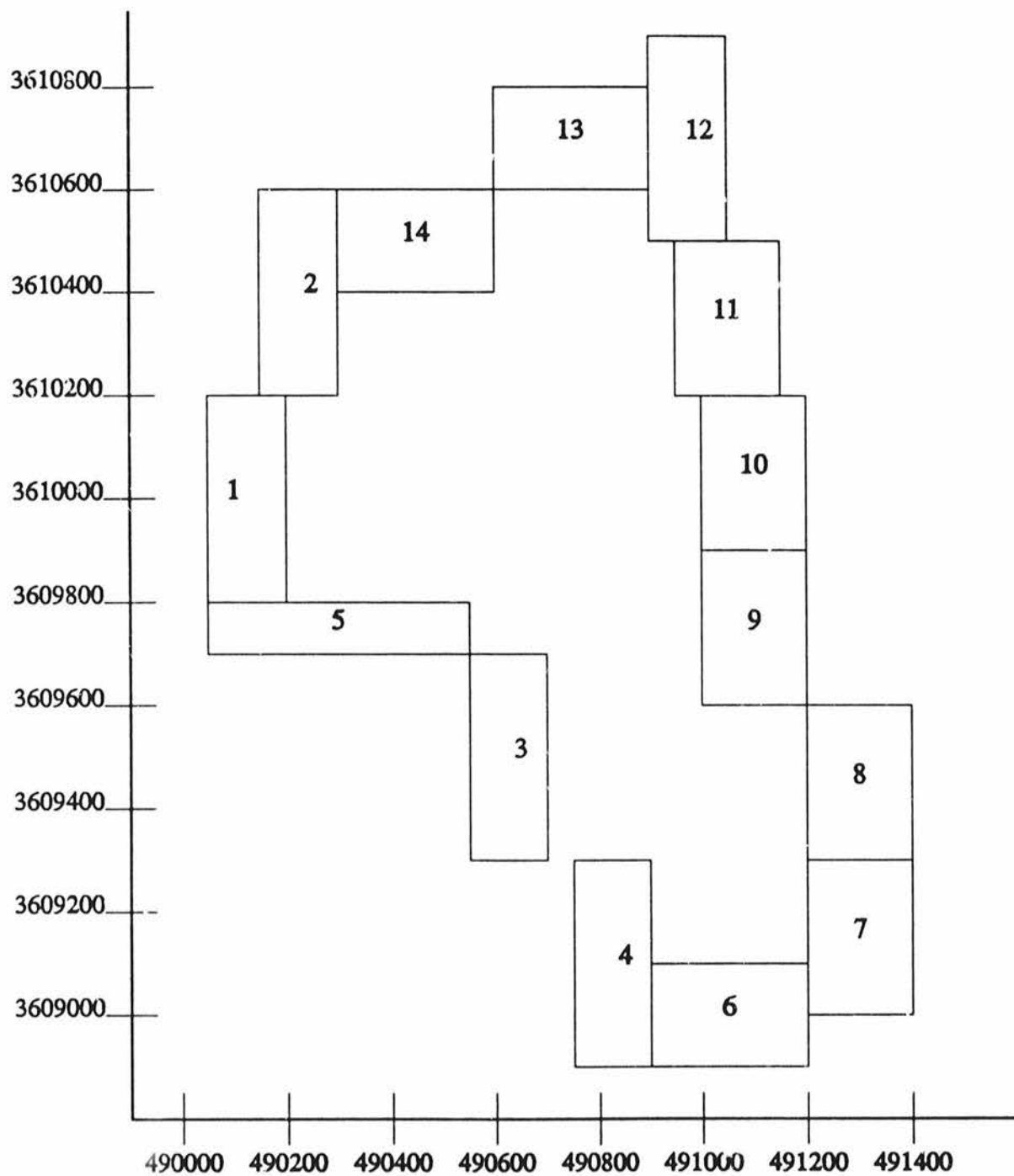


Figure 3. 100m receptor grids

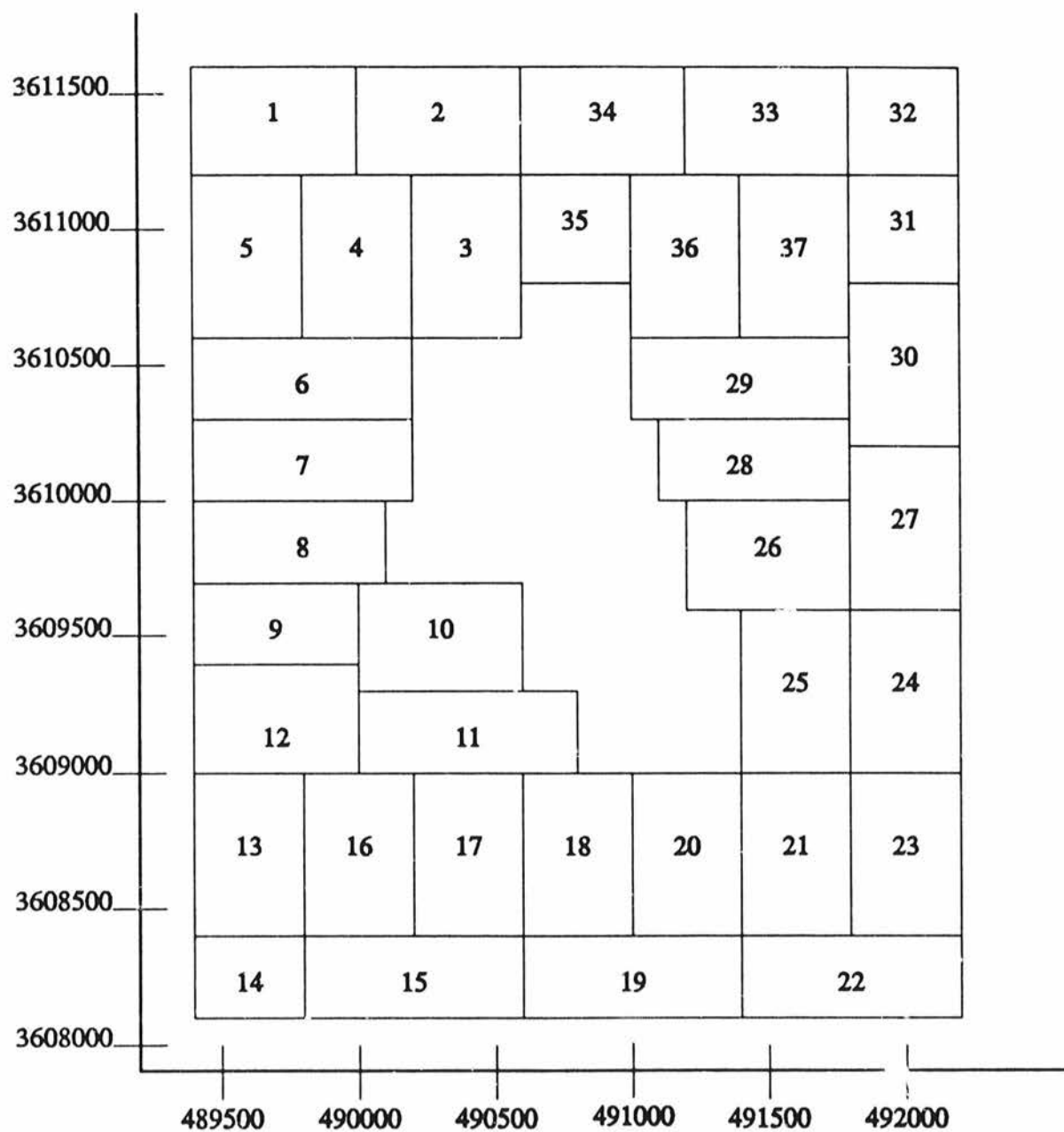
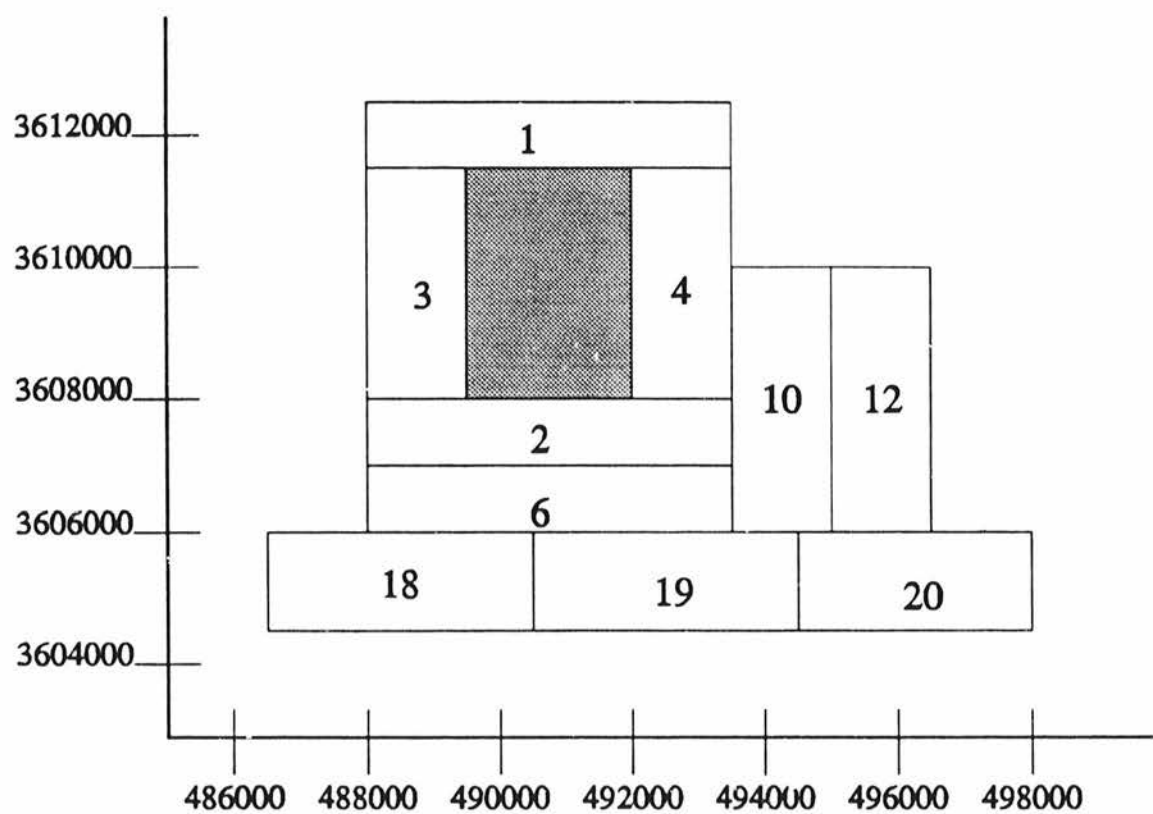
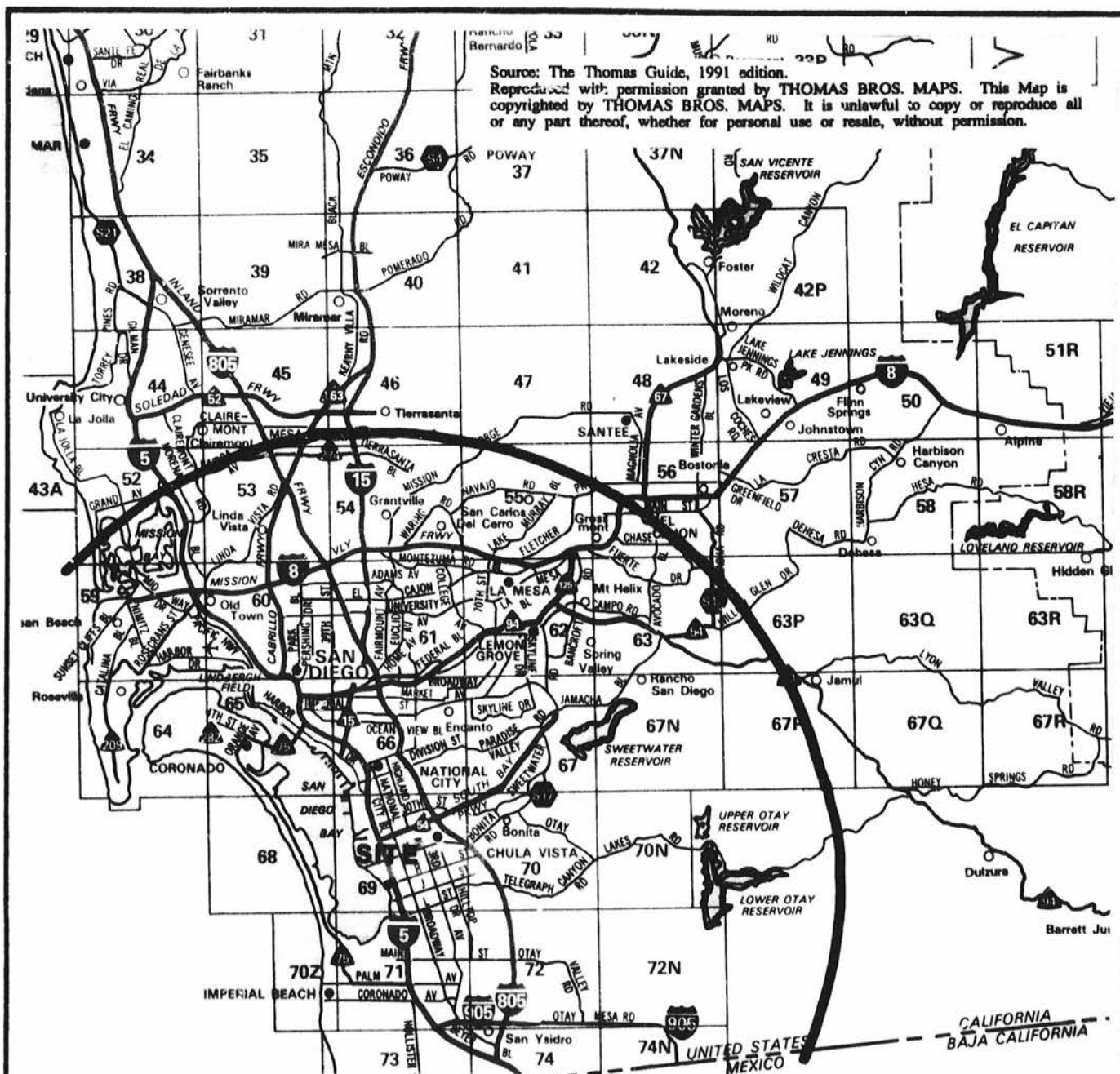


Figure 4. 500m receptor grids



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0.0 5 10
 Kilometers



Zone of Impact

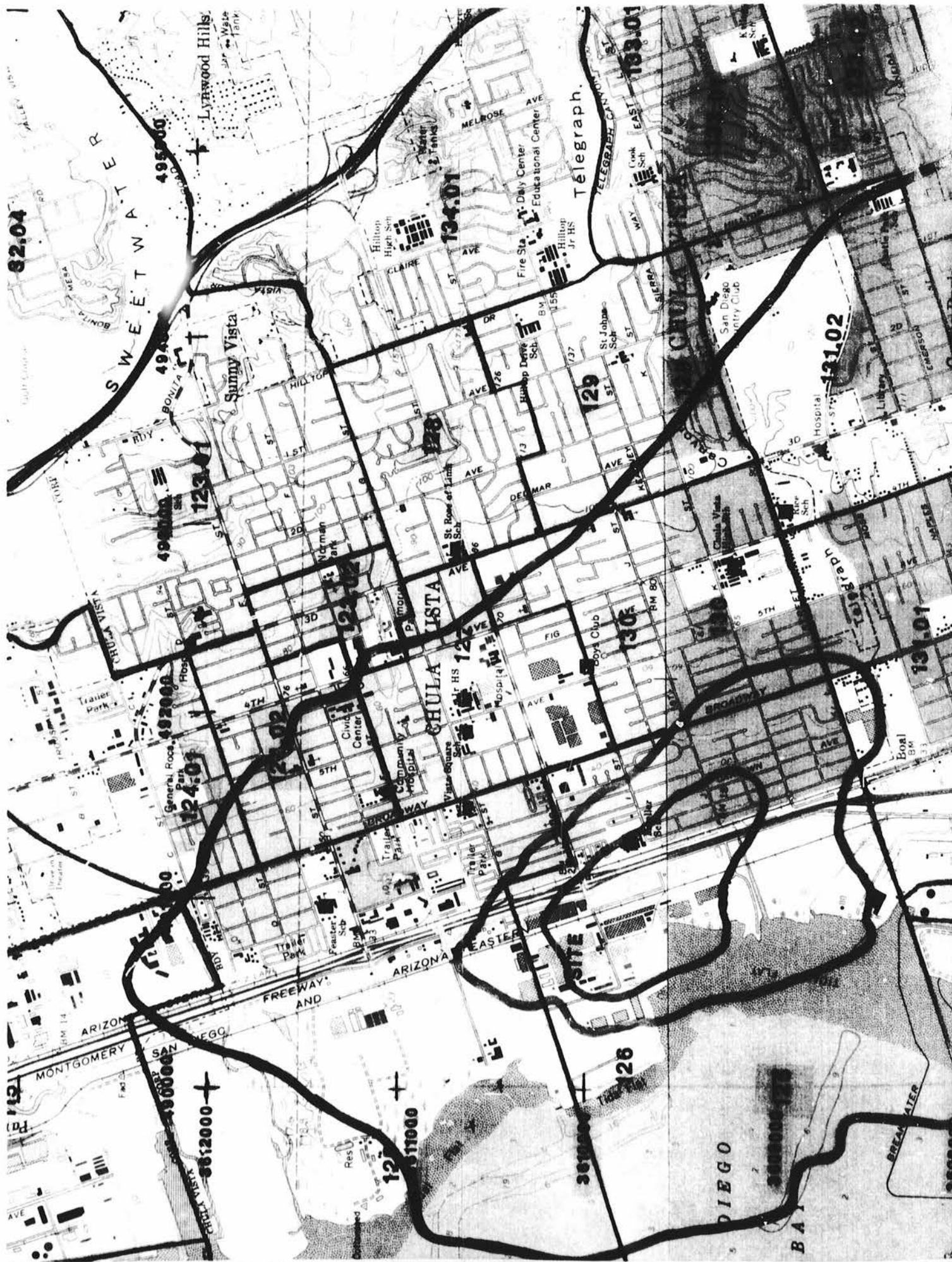
KH KLEINFELDER

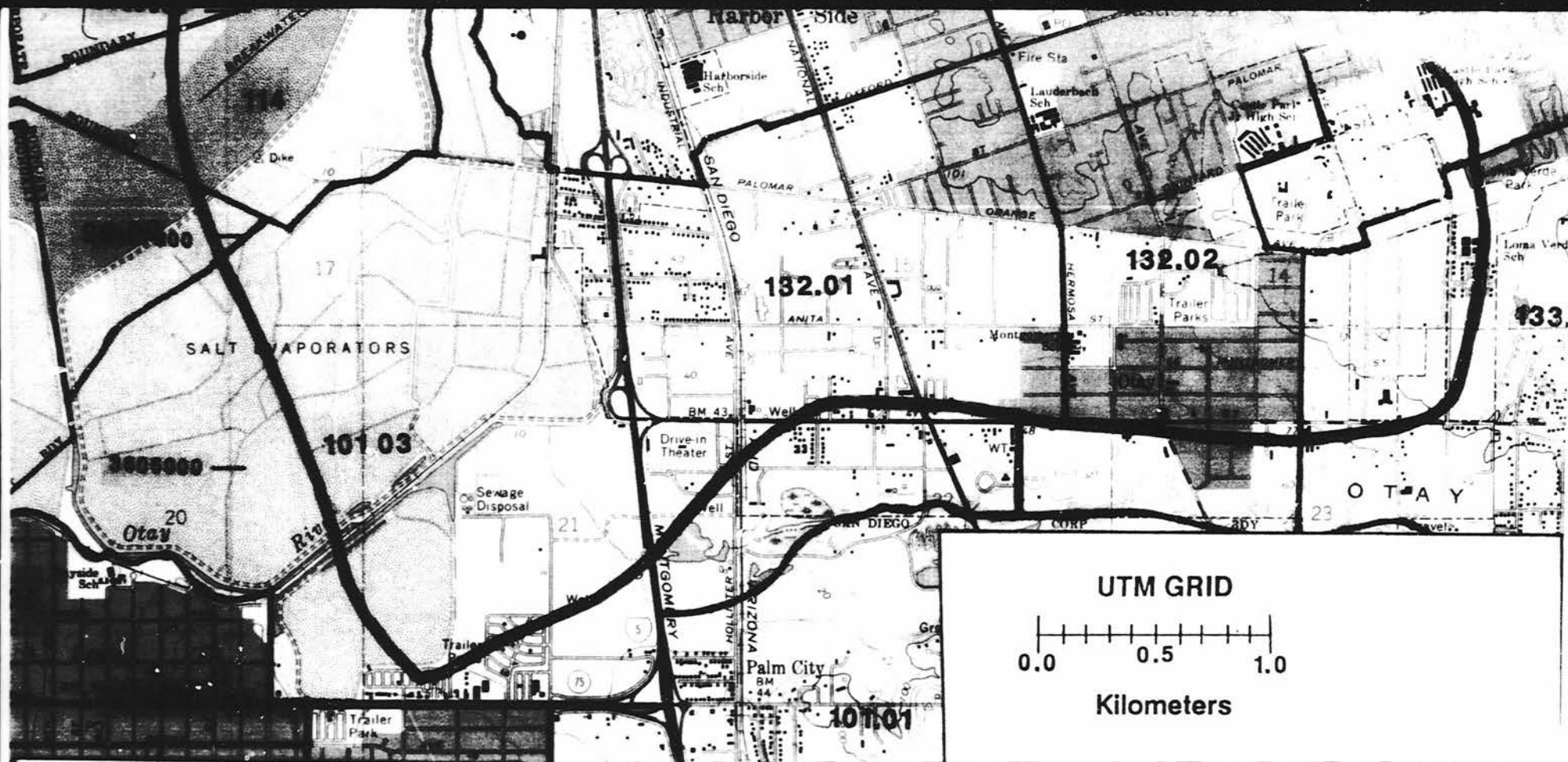
**Rohr Industries
 Zone Of Impact**

PLATE

5

PROJECT NO. 71-116102





KEY



Census Tract Number



Hospital



School



1 E-4 Risk Isopleth



5 E-5 Risk Isopleth



1 E-5 Risk Isopleth

USGS 7.5 Minute Topographic Basemap Scale 1:24,000 (1"=2000')

Imperial Beach Quadrangle 1967

National City Quadrangle 1967, photorevised 1975



KLEINFELDER

PLATE

6

PROJECT NO. 74-142402-004

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